

Amendments to and Listing of the Claims:

Please cancel claims 1, 4, 6 and 8-11 and substitute the following new claims 12-17:

1. 1-11. (Cancelled)

12. (New) A polymer electrolyte fuel cell stack comprising a plurality of unit cells, each unit cell composed of a first polymer electrolyte membrane, a cathode and an anode each having a catalyst reaction layer and disposed across said polymer electrolyte membrane, a separator having a means for supplying a fuel gas to said anode, and a separator having a means for supplying an oxidant gas to said cathode,

the plurality of unit cells being laminated as layers in a battery, the stack having disposed on both its ends a current collector plate, an insulating plate and an end plate,

said fuel cell stack further comprising a total heat exchanger having a plurality of unit humidifiers for concurrently moving heat and humidity from a discharged gas toward said fuel gas and oxidant gas, the total heat exchanger being installed inside the end plates disposed on both ends of said polymer electrolyte fuel cell,

each of said unit humidifiers comprising a second polymer electrolyte membrane placed between two sheets of carbon paper whose external sides are sandwiched between two plates, wherein the second polymer electrolyte membrane has a thickness not exceeding about 50 μm , and each of said unit humidifiers effecting total heat exchange and humidification via said second polymer electrolyte membrane,

wherein the plurality of unit humidifiers are laminated as layers to form the total heat exchanger, such that unit humidifiers for humidifying the oxidant gas alternate one by one with unit humidifiers for humidifying the fuel gas, and each oxidant gas humidifying unit humidifier is partitioned from each fuel gas humidifying unit humidifier by a total heat exchange plate.

13. (New) The polymer electrolyte fuel cell stack according to claim 12, wherein the first and second polymer electrolyte membranes are the same.

14. (New) The polymer electrolyte fuel cell stack according to claim 12, wherein the second polymer electrolyte membrane has a thickness not exceeding 25 μm .

15. (New) The polymer electrolyte fuel cell stack according to claim 12, wherein the two plates of the total heat exchanger each have a gas flow channel therein.

16. (New) The polymer electrolyte fuel cell stack according to claim 12, wherein the total heat exchanger is installed between said insulating plate and said current collector plate.

17. (New) The polymer electrolyte fuel cell stack according to claim 12, wherein the total heat exchanger is installed between said insulating plate and said end plate.